

gether are about equal in length to the tenth. Halteres light brown. The ovipositor is stout, cylindrical and furnished with a long needle-like organ which protrudes beyond the tip.

Length four mm. Emerges in September and October.

The pupa has two contiguous, short, subconical projections at the top of the head; the dorsal segments of the abdomen have on the middle of each a somewhat irregular double transverse row of short spines, and behind it a single regular row of similar spines, the last segment, at the tip, has a row

of such spines.

Osten Sacken compares, briefly, this pupa with *A. monacha*, Trans. Am. Ent. Soc. Vol. II, p. 301.

The galls are formed on the stem of *Helianthus grosse-serratus*, from a few inches to three feet or more above the ground; they are globular, spherical or ovate, in shape, from three-eighths of an inch to two inches in diameter.

The pupa in extricating itself from the gall may leave its case protruding from the place of exit or may drop to the ground before leaving its case.

## SOME ACCOUNT OF OUR SPECIES OF GEOTRUPES.

BY FREDERICK BLANCHARD, LOWELL, MASS.

Several familiar species of *Geotrupes* are among the first acquisitions made by the beginner of a collection of coleoptera in the Eastern United States. They are in fact so abundant and easily found that the interest in them soon ceases, and this part of one's collection makes about the poorest exhibit of the whole, from the fact that the clumsily pinned, poorly cared for specimens of our early inexperience alone appear as representatives of the species. As I have recently observed, however, in Mr. Henry Ulke's collection, a series of good examples of the different species and their varieties is an ornament instead of, as is too often the case, a disgrace to the collection. It is not always best to neglect old friends, and in our

common species of *Geotrupes* the very interesting male peculiarities are quite worthy of occasional attention, as they form the basis of a natural classification.

In 1865 M. Henri Jekel published in the "Annales de la Société Entom. de France," an arrangement of the species of this genus, adopting the plan of making subgenera of the different divisions, paying especial attention to our North American species, and describing several from this country as new. A little later Dr. G. H. Horn, in 1867, in the Transactions of the Amer. Ent. Soc. vol. i, reviewed M. Jekel's paper at length as far as it related to our species, placing before American students the true relations and limits of the species at the same time very properly suppress-

ing of all M. Jekel's new species, but one, as varieties of well known species. Since Dr. Horn's paper appeared Dr. Le Conte has described *G. chalybaeus* from an imperfect specimen found in Florida, and Dr. Horn has described *occidentalis* from a single ♀ from California, giving at the same time a table for the determination of the species. In the present essay two more species are made known and as one of them is not admissible into any of the subgenera of Jekel, in order that its characters may be properly understood, it seems worth while to pass in review the different forms hitherto known in our fauna. At the same time an opportunity is afforded me by the kindness of Mr. Ulke to give some further details respecting *G. chalybaeus*. This last species by its form and structure is an obvious interruption in our series, and I have placed it at the end of the genus for the present. It seems equally out of place among any of the exotic subgenera mentioned by Jekel, and the proper course appears to be to establish a distinct genus for it.

The genus is primarily divided by Jekel into those having the second joint of the antennal club entire and into those having the second joint more or less emarginate beneath so that when the joints are closed the margin of the joint is more or less hidden. This appears to be a natural division, but in the case of *G. balyi*, the only species thus far known in our fauna belonging to the second division, there has been some confusion on the part of Jekel, and also

in American collections from the fact that in many specimens the second joint of the club is only very slightly thinned at the lower margin, or even not noticeably different from the normal form. A better character for our fauna is the one pointed out by Dr. Horn, namely the greater widening of the elytral margin towards the base. In his description of *starkii*, based upon a ♀ specimen and included in the subgenus *Onychotrupes*, Jekel alludes to this broad margin in his specimen as being peculiar to *starkii* and not seen in the other species of the subgenus. Dr. Horn, however, at once recognized that *starkii* was simply a specimen of *balyi* with the antennal club normal. Another character accompanying the wider elytral margin in our fauna is seen in the sutural and second striae of the elytra. In the first division, in all of our striate species except one, the sutural stria is interrupted by the scutellum, and does not reach the base, while the second stria is entire and reaches the base of the elytra. In the second division the sutural stria arises at the base of the elytra and follows closely the margin of the scutellum, thus interrupting the second stria which in this case fails to reach the base.

*G. balyi* was included by Jekel in his subgenus *Anoplotrupes*, the species of which do not have any special ♂ characters. While recently studying this species it was observed that in certain large quite black individuals associated with the usual dark bronzed green forms under the same name, the sexes were

very readily separated by quite unique characters in the ♂ which were entirely absent in the true *Anoplotrupes*. Following the Jekelian plan this newly recognized form should be placed as a subgenus between his *Canthotrupes* and subgenus *Geotrupes* for which the name *Melanotrupes* is suggested, and full particulars given further on.

*Geotrupes chalybaeus* is much less convex than usual, the sides of the thorax at base moderately explanate, the sides of the elytra rather strongly explanate in front, the margin being wide as in *Melanotrupes* and *Anoplotrupes*, but flatter; the epipleuræ are also horizontal instead of oblique as usual; there is within the margin a marked constriction of the sides of the elytra behind the humeri. The most remarkable peculiarity of the species is in the form of the middle and hind tibiae. Instead of having the apex on the outer side indicated by a well-defined ridge as usual, the ridge is completely absent, and only its position is indicated by two or three bristles, so that the apex as seen from above or below is broadly rounded or very obliquely truncate. This character appears to be quite anomalous in *Geotrupes*, as, if it had existed in any of the species known to Jekel it would have been noticed, as he is very particular in giving the form of the tibiae and the number of transverse ridges on the outer face counting the apical as first. Some further particulars will be given under this species below. The name *Peltotrupes* might be used for this subgenus.

The following arrangement of the

subgenera is based upon Dr. Horn's, given in the "Transactions," vol. i.

- a. Middle and hind tibiae with apical ridge on the outer side.
- b. Apterous, elytra connate, metasternum short, thorax dissimilar anteriorly in the two sexes, elytra not striate. *Mycotrupes*.
- bb. Alate, elytra free, thorax similar ♂ and ♀.
- c. Elytral margin moderate, antennae with the second joint of the club normal, entire, apex of anterior tibiae produced inwardly in the ♂, simply toothed in the ♀.
- d. Middle tarsi of the ♂ very short and thick, claws of the same chelate. *Onychotrupes*.
- dd. Middle tarsi and claws of the ♂ normal. *Cnemotrupes*.
- cc. Elytral margin broad towards the base, second joint of antennal club more or less emarginate or truncate beneath, but sometimes not distinctly so, sutural stria reaching the base, second interrupted, apex of anterior tibiae alike in both sexes.
- e. ♂ with anterior thighs toothed at base, anterior tibiae with the third tooth from the apex deflexed, partly inferior. *Melanotrupes*.
- ee. The sexes alike. *Anoplotrupes*.
- aa. Middle and hind tibiae without external apical ridge. *Peltotrupes*.

The only species of *Mycotrupes* is *retusus* Lec. "found in the southern states feeding on fungi or under dried animal matter."

Of *Onychotrupes* there are two species in our fauna, *splendidus*, variable in brilliancy of color from "brilliant metallic green to a dark bronze," the elytral striae are punctured, the basal margin of the thorax is entire. Second, *semiofacus*, having the head not tuberculate, the thorax usually with the basal marginal line absent in a greater or less degree and with the striae of the elytra impressed but not punctate, interstices flat, smooth. The ♂'s in this subgenus have the hind thighs with a small tooth, more or less marked, at the base beneath. The inferior longitudinal carina of the anterior tibiae is distinctly serrate in both sexes of *splendidus*, but only feebly crenate in *semiofacus*. The middle and posterior tibiae have usually four distinct transverse ridges on the outer face in both.

As only the ♀ of *G. occidentalis* is known it is not certain that it is a *Cnemotrupes*. I have however included it in the following table:

Thorax with basal margin entire.

Anterior tibiae of ♂ with a long spur, scutellum transverse.

Shining dark bronzed green, elytral striae coarsely crenately punctured, club yellow. *egeriei*.

Opaque, striae punctured, scarcely impressed, club sooty. *opacus*.

Anterior tibiae with a short spur in the ♂, scutellum equilateral, striae rather finely punctured.

*blackburnii*.

Thorax with basal margin obsolete at the sides.

Elytral striae very feebly impressed, punctured, head not tuberculate, apical spur of ♂ short, scutellum very small. *ulkei*.

Elytral striae impressed and punctured, head tuberculate.

*occidentalis*.

In the first three species the hind thighs are toothed in the ♂ and the inferior carina of the front tibiae is serrate in both sexes, more strongly in the ♂, and in *blackburnii* the alternate teeth are sometimes very prominent. The middle and hind tibiae in the same species have about four transverse ridges, the upper one sometimes imperfect.

*Geotrupes ulkei* n. sp.—Size small, convex, shining brown bronze, lateral margins of the thorax and elytra blue. Head shining, rough in front and at the sides, rather sparsely punctate behind, clypeus broadly rounded in front, feebly convex without any evident tubercle, sides of the head rounded as usual forming at its junction with the clypeus an obtuse reentrant angle, clypeal sutures impressed, the usual ante-ocular ridges present. Antennae with the fourth joint shorter than the third or fifth, club sooty. Thorax nearly twice as wide as long, the apex more than half as wide as the base, sides strongly rounded and margined, angles all rounded, base lobed at middle, marginal line distinct at middle, quite absent each side, surface faintly punctulate, very sparsely punctured on the disc except on the median line which is slightly impressed

and more closely punctured, punctures more numerous at the sides where the usual fovea is evident. Elytra about twice as long as the thorax and scarcely wider, slightly narrowed at base thence with the sides broadly rounded to the apices which are prominent and not at all inflexed. Striae fine and but feebly impressed, with rows of small punctures, intervals flat with a sparse and rather indistinct punctulation, scutellum equilateral, smaller than usual so that the sutural striae reach the base, but they are not so near the scutellum as in *G. balyi* etc., nor do they interrupt the second striae which reach the base as usual in the subgenus. Body beneath black or slightly bronzed, rather sparsely clothed with brown pubescence and bristles; mesosternum with a prominent somewhat semicircular crest between the coxae; middle tibiae shorter than the posterior ones, gradually wider like them, but thicker when viewed laterally, both pairs have three distinct transverse ridges counting the apical one; the anterior tarsi are more slender than the others, the first joint short, the second equal in length to the third and fourth united, but more slender; in the middle and hind tarsi the first joint is elongate nearly equal to the next three which are but little longer than wide and gradually decrease in length and thickness, last joint longest in the middle tarsi, about equal to the first joint in the hind pair, longest spur of middle and hind tibiae equal to the first three joints in the ♂, scarcely longer than the first two joints in the ♀.

Anterior tibiae with five or six lateral teeth, the inferior ridge finely, sparsely, crenulate or denticulate in both sexes. In the ♂ the apex of the front tibiae is strongly, acutely produced obliquely inward and forward, the terminal spur is short not very stout about equal in length to the second joint of the tarsi. Hind thighs unarmed.

Length, ♂ 11 mm., .44 in.; ♀ 12 mm., .48 in.

One pair Va. found by Mr. Ulke in fungi.

On comparison with diminutive specimens of *blackburnii* and *balyi* of the same size, the scutellum is seen to be distinctly smaller in the present species.

It affords me great pleasure to give Mr. Ulke's name to this interesting little species in recognition of many favors.

In the subgenus *Melanotrupes* the following described species only is known to me:

*G. hornii*, n. sp.—Black, shining, without any metallic reflections clothed beneath with dark brown hair, form robust. Clypeus oval, a little more prominent in the ♀, its entire surface rugose punctate, a distinct tubercle behind more or less acute, the sutural impression deep, the antecular ridges of the head are well marked, the sides rounded as usual; antennae with the fourth joint shorter than the third or fifth, club yellow with the second joint more or less emarginate or truncate and thinner below; thorax of the usual form, broadly emarginate in front, the

angles distinct scarcely rounded, somewhat obliquely wider to the middle, thence rounded and inflexed at the posterior angles which are rounded, usually a little wider behind the middle, a median impressed line more or less punctate, disc sparsely and irregularly punctate, sides more closely, the usual lateral fovea distinct, basal margin distinct; scutellum triangular as usual, smooth or with a few punctures, sometimes impressed; elytra about as wide as the thorax, a little narrower at the base, broadly rounded to the apex which is obtuse, the margins slightly inflexed at the suture, striae strongly impressed and crenately punctured, rather more coarsely than in *balyi*, intervals convex, smooth, sutural striae embracing the scutellum and reaching the base, second stria more or less interrupted by the sutural and not reaching the base, margin of elytra much wider anteriorly; anterior tarsi with joints one to four subequal, last joint nearly equal to the three preceding; spurs of anterior tibiae long in both sexes, reaching the apex of the third joint of the tarsi or beyond; mesosternum carinate between the coxae, produced forward in a rounded crest; middle and hind tibiae with three transverse ridges on the outer face, the upper one incomplete, middle tibiae shorter than the last, the tarsi also a little shorter with the first joint about equal to the next three together, while in the last, the second, third and fourth joints are a little more elongate and together obviously exceed the first in length;

spurs of middle and hind tibiae long and slender, the longer one of the middle tibiae reaching the apex of the third joint, that of the hind tibiae reaching the apex of the second joint; inner apical process of the hind tibiae subparallel, rounded at tip and one-half as long as the first joint of the tarsi. The ♂ has the base of the anterior thighs below with a conspicuous oblique ridge or broad tooth, the anterior tibiae with the third tooth from the apex deflexed and produced beneath, sometimes meeting a slight angulation of the inferior carina, this carina at about one-third from the base has a prominent tooth. The ♀ has the anterior thighs and tibiae simple.

Length 13.-18. mm; .52-.72 in.

Specimens are before me from Mass., D. C. and N. C. and I infer that the species has a similar distribution with our common species. It appears to have been sufficiently rare to have escaped the earlier authors and later has probably been confounded with *balyi* from which it differs apart from the sexual characters by the always distinctly black color without any metallic reflections, the more advanced clypeus, the less sparsely and rather more strongly punctured thorax, the mesosternal crest rounded instead of acute, the hind tibiae with the upper or third ridge more developed and the apical process longer and narrower at base. So far as observed the emargination of the second joint of the antennal club is well marked.

In dedicating this very distinct

species I would express my hearty admiration of the great zeal and success in studying our Coleoptera, of Dr. Geo. H. Horn.

Of the habits of *G. hornii* I cannot now say much. Mr. Ulke writes me that he finds it under electric lights in Washington, but that he does not thus find *balyi*, which is common, he says, in the mountains of Virginia. The latter species is also common about fungi in Massachussets.

*Anoplotrupes* has but one species in our fauna, *balyi*, sufficiently defined by the table of subgenera and the comparative notes above. It is usually smaller than *G. hornii*, the color is usually a deep black green and always more or less metallic. Specimens have been seen with the bottom of the striae distinctly purple, others have the whole surface of the elytra and even the thorax purple.

*Peltotrupes chalybaeus* is polished black blue with the lateral margins of a brighter blue, three or four striae next the suture on each side are impressed, the others hardly impressed, all have rows of fine punctures. The anterior tibiae have on the upper surface the usual inner impressed line bearing a row of setae but the adjacent outer carina is quite absent. The middle and hind tibiae are rather densely fringed with spines on each outer margin and on the cross ridges and the spaces between are punctate and bear short bristles; in our other *Geotrupes* the middle and hind thighs are flattened posteriorly to receive the tibiae, and

have the margins finely elevated each side, while in *chalybaeus* they are convex behind with a single strong margin which is next to the upper side.

The middle and hind tarsi are rather thickly beset with long bristles; the claws are long and slender.

In the ♂ the apex of the anterior tibia is abruptly and strongly produced inwardly and the spur is rather short; there is a small tooth directed inwardly behind the insertion of the tarsi; the inferior carination of the tibiae is armed with three or four prominent teeth alternating with finer ones, the hind thighs are toothed at base. The ♀ has not been seen by me.

The third and fourth joints of the antennae are equal, fifth to eighth gradually shorter and thicker.

In the preceding pages I have had all of the species mentioned before me with the exceptions of *retusus* and *occidentalis* and I have freely availed myself of the information given by Dr. Horn in his paper.

#### GEOTRUPES Latr.

##### MYCOTRUPES Lec.

*G. retusus* Lec. Proc. Acad. 1866, p. 381.

##### ONYCHOTRUPES Jekel.

*G. splendidus* Fabr. Syst. Ent. p. 18, no. 63.

*miarophagus* Jekel, Monog. loc. cit. p. 611.

*var. mixtus* Horn. Trans. v. 1. p. 316.

*G. semiopacus* Jek. l. c. p. 612.  
*melsheimeri* Jek. l. c., p. 613.

CNEMOTRUPES Jekel.

*G. egeriei* Germ. Ins. Spec. i, p. 144.  
*lecontei* ♀ Jek. l. c., p. 592.  
*G. opacus* Hald. Proc. Acad. 1853, p.  
 362.  
*haldemani* Jek. l. c., p. 593.  
*chevrolati* Jek. l. c., p. 595.  
*G. blackburnii* Fabr. Spec. Insect. i,  
 p. 20, no. 85.  
*excrementi* Say, Jour. Acad. iii, p.  
 210.

*var. jekellii* Horn l. c., p. 317.  
*conicollis* Jek. l. c., p. 591.

*G. ulkei* n. sp.

*G. occidentalis*. Horn Trans. v. viii,  
 p. 144.

MELANOTRUPES.

*G. hornii* n. sp.

PELTOTRUPES.

*G. chalybaeus* Lec. Proc. Am. Phil.  
 Soc. v. xvii, p. 402.

NOTE ON CHINCH BUG DISEASES.

BY STEPHEN ALFRED FORBES, CHAMPAIGN, ILL.

Two diseases of *Blissus leucopterus*, apparently efficient in suppressing an outbreak of this species in 1882, were described by me in my Report for that year as State Entomologist of Illinois (pp. 47-54); but neither of these has been distinctly recognized since, until the present season. Now, however, the chinch bugs of the southern part of Illinois are being very rapidly destroyed by both these diseases, and a third not hitherto recognized,—the last (seen by me first in July, 1887) due to a *Botrytis* distinct from the species (*B. bassiana*) well known as the characteristic fungus of muscardine in the silkworm.

One of the two first mentioned is caused by an *Entomophthora* whose specific affinities I have not been able to learn.

The other is due to a microbe (the

*Micrococcus insectorum* of Burrill\*) principally developed in the alimentary canal, and especially in its cæcal appendages, which are often literally crammed with it from end to end. This disease somewhat resembles that known as *schlaffsucht* or *flacherie* in the literature of the silkworm. Its germ is freely cultivable both in beef broth and in solid gelatine media, by the processes usual in bacterial investigation.

Both the *Entomophthora* and the *Botrytis* finally imbed the insect in a white fungus,—the efflorescence of a spore-bearing mycelium. The *Botrytis* has been much more abundant

\* American Naturalist XVII, p. 319. This microbe, studied anew by Prof. Burrill from my recent cultures, solid and fluid, and from the affected chinch bugs themselves, proves to be a *Bacillus* of peculiar character, and not a *Micrococcus*.